

REMARKS

References to sections of text in the instant application are made to United States Patent Application Publication 2008/0092853.

Applicants request that the Finality of the Office Action be withdrawn. The Office Action cites references for the first time and applies the newly cited references in rejecting the application. Applicants only seek a fair opportunity to respond to the references and the rejection.

Claim Rejections under 35 USC 102(b)

Claims 1, 2, 7, and 8 stand rejected under 35 USC 102(b) as being anticipated by United States Patent Number 6,113,014 to Coldren et al. For the following reasons, reconsideration and withdrawal of these rejections are requested.

Coldren applies a single control current signal to terminals 51 and 52 to operate a spill control valve 40 and a needle control valve 30; see Fig. 4. The single control current is routed through a diode network so the spill control valve 40 is closed regardless of current polarity, but the needle control valve 30 is only opened when negative current is applied; see Fig. 3 and column 3, lines 53-58. However, Coldren is unable to simultaneously open the spill control valve 40 and open the needle control valve 30, and the moment of transitioning the spill control valve 40 from closed to open necessarily occurs at the same moment of transitioning the needle control valve 30 from open to closed. As such, Coldren is prevented from independently controlling current signal timing of opening the spill control valve 40 and closing the needle control valve 30. In deed, when negative current is applied, the current through the spill control valve 40 and the needle control valve 30 are equal as the valves are effectively wired in series.

In contrast, Applicant uses two independent current signals to independently operate a spill control valve 20 and a nozzle control valve 22, see Fig. 4 and paragraph 0041. As set forth in claim 1, a first drive current signal is applied to the spill control valve 20 to move the spill control valve 20 from the closed state to an open state. That first drive current signal is followed by a second drive signal applied to the needle control valve 22 to move the nozzle

control valve from the open state to a closed state. The use of 'followed by' clearly indicates that transitions of the first drive current and the second drive current are temporally distinct. Applicant uses the independent control feature to reduce the overshoot problem illustrated in Fig. 2 and 3, see paragraph 0011.

In rejecting claim 1, the Office Action points to Coldren Fig. 4B as being comparable to Applicant's first drive current, and points to Coldren Fig. 4C as being comparable to Applicant's second drive current. Applicant respectfully points out that Fig. 4B-C indicate the position of the spill valve and needle control valve respectively, and so are not comparable to Applicant's independent and distinct first drive current signal and second drive current signal. Furthermore, as Coldren's illustrations suggest that the transition times of the spill valve and needle control valve are instantaneous, there is no evidence that Coldren even contemplates the possibility of altering the timing of the spill control valve and the needle control valve position to improve injector performance with regard to acoustic noise or engine emissions performance, or for any other reason.

Claim 1 is directed to a method that includes the step of modifying the first drive current signal applied to the spill valve so as to move the spill valve from the closed state to an open state during a spill valve opening period, followed by modifying the second drive current signal applied to the nozzle control valve so as to move the nozzle control valve from the open state to a closed state during the spill valve opening period, so as to urge the valve needle towards its seating and terminate the main injection of fuel. Coldren does not teach or suggest two independent current signals where one could follow the other.

Thus, claim 1 defines an invention that is not anticipated by Coldren or any other prior art reference, and so is allowable. Claims 2 and 7-8 variously depend from claim 1. Therefore, since claim 1 is allowable for the reasons set forth above, dependent claims 2 and 7-8 are also allowable. Reconsideration and withdrawal of the rejection of claims 1-2 and 7-8 is requested.

Claim Rejections under 35 USC 103(a) based on Coldren

Claims 5 and 6 stand rejected under 35 USC 103(a) as being unpatentable over United States Patent Number 6,113,014 to Coldren et al. For the following reasons, reconsideration and withdrawal of these rejections are requested.

Claims 5 and 6 are dependent on claim 1. For the same reasons set forth above, Coldren does not teach or suggest the features set forth in claim 1 and so does not teach or suggest the features set forth in claims 5 or 6 dependent thereon. Reconsideration and withdrawal of the rejection of claims 5 and 6 is requested.

Claim Rejections under 35 USC 103(a) based on Coldren in view of Archer

Claims 3 and 4 stand rejected under 35 USC 103(a) as being unpatentable over United States Patent Number 6,113,014 to Coldren et al. in view of United States Patent Number 5,825,216 to Archer et al. For the following reasons, reconsideration and withdrawal of these rejections are requested.

Claims 3 and 4 are dependent on claim 1. For the same reasons set forth above, Coldren does not teach or suggest the features set forth in claim 1 and so does not teach or suggest the features set forth in claims 3 or 4 dependent thereon.

Archer describes a solenoid controller as part of a control system for a fuel injector 15, see Fig. 1-2. In particular, Archer is concerned with detecting a discontinuity in a decaying current so as to detect when a valve member reaches an end position; see Fig. 3 and column 1, lines 56-64. However, like Coldren, Archer does not teach or suggest two independent current signals where one could follow the other. Therefore, for the same reasons set forth above, neither Coldren nor Archer, individually or combined, teach or suggest the features set forth in claim 1 and so do not teach or suggest the features set forth in claims 3 or 4 dependent thereon. Reconsideration and withdrawal of the rejection of claims 3 and 4 is requested.

Claim Rejections under 35 USC 103(a) based on Coldren in view of Straub

Claims 9-12 stand rejected under 35 USC 103(a) as being unpatentable over United States Patent Number 6,113,014 to Coldren et al. in view of United States Patent Number 7,150,410 to Straub. For the following reasons, reconsideration and withdrawal of these rejections are requested.

Claim 9 is directed to a method that includes the steps (i) actuating the spill valve at a first time followed by (ii) actuating a nozzle control valve at a second time, and subsequently actuating the spill valve at a third time. Claim 9, like claim 1, describes a method that

independently controls the timing of actuating two distinct valves. As such, for essentially the same reasons given with regard to claim 1, Coldren does not teach or suggest anything regarding independent timing control of distinct valves.

Straub describes a method of controlling solenoid current to control solenoid valve motion, see Fig. 3. However, like Coldren, Straub does not teach or suggest two independent current signals where one could follow the other. Therefore, for the same reasons set forth above, neither Coldren nor Straub, individually or combined, teach or suggest the features set forth in claim 9 and so do not teach or suggest the features set forth in claims 11-12 dependent thereon. Reconsideration and withdrawal of the rejection of claims 9-12 is requested.

CONCLUSION

In view of the foregoing, Applicants request reconsideration and withdrawal of the rejections of claims 1-12. Applicants respectfully submit that all of the pending claims fully comply with 35 U.S.C. §112 and are allowable over the prior art of record. Reconsideration of the application and allowance of all pending claims is earnestly solicited. Should the Examiner wish to discuss any of the above in greater detail or deem that further amendments should be made to improve the form of the claims, the Examiner is invited to contact the undersigned at the Examiner's convenience.

Please charge any necessary fees, including any extension of time, or any other fee deficiencies to Delphi Technologies, Inc., Deposit Account No. 50-0831.

Respectfully submitted,

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